SEDIMENT PHYSICAL AND CHEMICAL CHARACTERISTICS
CHETCO RIVER FEDERAL NAVIGATION PROJECT

APRIL 1982

1. Synopsis. Sediment samples were obtained for elutriate, bulk sediment, and physical analyses from the Chetco River Federal navigation channel within the port of Brookings moorage area (figure 1). The samples were obtained at the north end of the navigation channel (Site 3), at an intermediate point between the small boat access channel and the barge turning basin (Site 2), and in the barge turning basin opposite the barge slip (Site 1). Water was collected at the mouth of the boat basin for use in the elutriate tests. Results were evaluated in accordance with Federal regulations for dredged and fill material (ocean dumping regulations and 40 CFR 230[2,3]).

BACKGROUND

2. The Chetco River is located in southwest Oregon. It discharges into the Pacific Ocean approximately 8 miles north of the California state border. The estuary consists of a 102-acre bay which contains 12 acres of tidal wetland. The lower 3-1/2 miles of the river are subject to tidal influences. The tidal range between mean lower low water (mllw) and mean higher high water (mhhw) is 6.9 feet and the extreme tidal range is 13.0 feet. The project site, the Port of Brookings, is located on the south side of the river near its mouth.

3. The Federal navigation channel at this project consists of an entrance channel 120 feet wide and 14 feet deep, a barge turning basin approximately 250 feet wide, 650 feet long, and 14 feet deep; a protective dike 1,800 feet long; and a small boat access channel, 100 feet wide and 12 feet deep. The river entrance is protected by two jetties. The Portland District, Corps of Engineers maintains these various structures and channels. Sediments

obtained from maintenance dredging operations have been discharged into the EPA designated, interim, ocean disposal site (DS) which is located 5,000 feet offshore (figure 2) since 1971.

4. In accordance with PL 97-88, FY 1982 Energy and Water Development Appropriation Act, recommended improvements at Chetco River are proposed. These improvements would include extending the north jetty by 750 feet; extending the south jetty by 1,200 feet; and deepening the entrance channel and turning basin to 16 feet mllw.[1] Dredged sediments would be discharged at the ocean or the upland DS located adjacent to the turning basin.

5. Regulations promulgated pursuant to Section 103 of the Marine Protection, Research, and Sanctuaries Act[2] and Section 404 of the Clean Water Act (40 CFR 230), [3,4] and Portland District, Corps of Engineers guidelines[5] specify that dredged material disposal operations must be evaluated prior to dredging to determine if significant physical, chemical, or biological impacts will result from disposal operations. Data on the physical characteristics of dredging and DS sediment indicate if further chemical and biological data is needed. Generally, if dredged sediment consists of fine grained material or contains more than 4 percent organic material or volatile solids, and is to be placed on dissimilar material, chemical and/or biological data is obtained to determine if harmful levels of contaminants are present.[5] This report addresses the physical and chemical quality of the sediments which must be dredged for both the proposed deepening and maintenance of the project.

6. Previous sampling efforts at several points within the navigation channel in 1981 indicated that sediments at river mile 0 consisted of sand; between river mile 0 and the mouth of boat basin consisted of silty-sandy-gravel; the small boat access channel consisted of silt; and the turning basin ranged from silty-sand to gravelly-silty-sand. Only those sediments from river mile 0 to the boat basin's mouth were determined to be suitable for disposal without additional chemical analyses. A sidescan sonar survey was performed in both the navigation channel and ocean DS.[6] The results substantiated the sediment sampling findings, showing that sediments graded from sand to sandy silt from the mouth of the river inward. The ocean

disposal site was shown to consist of patches of sandy silt, sand, and rock. Pursuant to these findings and the need for chemical data, three sediments samples from the boat basin and small boat access channel were obtained on 6 April 1982 for chemical analyses. Physical data was also obtained on these samples to substantiate previous data.

METHODS

7. The sediment samples were collected for elutriate, bulk sediment, and physical analyses. A small, port-owned rowboat was used as a sampling platform. Field notes are presented in table 1. Receiving water samples were collected from the Coast Guard dock at the mouth of the boat basin for use in performing elutriate tests. The water was also analyzed to provide background data on the water quality in the area.

8. The sediment samples were obtained with a 9 by 9 inch, 45 pound Ponar grab sampler. The sediments were emptied into a stainless steel pan and subsequently transferred to two foot-long, 2-5/8-inch-diameter sample containers. These containers were made of transparent cellulose butyrate acetate and were sealed with polyethylene caps. All equipment was acid cleaned. Samples were iced for transportation to the analytical laboratory. Upon reaching the laboratory, the samples were extruded, composited, and subsampled for elutriate, bulk chemical, and/or physical analyses. The elutriate and the bulk sediment analyses were performed by U.S. Geological Survey (USGS) following the procedures discussed in the USGS publication, "Native Water, Bottom Material, and Elutriate Analyses of Selected Estuaries and Rivers in Western Oregon and Washington."[7,17] The physical analyses were performed by the Corps North Pacific Division Materials Laboratory on samples which were provided by USGS. The methodologies used for the physical analyses are those described in the 14th Edition of <u>Standards Method for Examination of Water and Wastewater</u>.[8]

9. The bulk sediment analysis consisted of a soft digestion of the sediments. This type of analysis tests only those contaminants which are adsorbed to the sediment surface, not those which are minerologically bound.

This is not the same as a hard or total digestion which also measures minerologically bound contaminants. The water used in the elutriate analyses was collected with a Scott-modified, Van Dorn water sampler. The water was transferred to acid cleaned, collapsible, polyethylene containers and stored in ice for transport to the laboratory.

10. A Hydrolab 8000 water quality testing system was used to measure dissolved oxygen, pH, oxidation reduction potential (ORP), conductivity, and temperature at the Coast Guard dock (table 4).

11. Physical analyses were performed to determine if sediments meet the exclusion criteria set up in Section 227.13(b) of the ocean dumping regulations (P.L. 92-532)[2] and Section 230.4-1(b)(1) of the Section 404 regulations.[3] The Portland District, Corps of Engineers, conservatively defines such sediments as consisting of 80 percent by weight of particles larger than silt (>.074 mm in diameter) and containing less than 4 percent volatile solids.[5] The criteria specify that such dredged materials do not have to undergo an evaluation of chemical-biological interactive effects.

12. The grain size of sediments is important in determining physical and chemical impacts of discharge operations. Unconsolidated, fine-grained materials, in comparison to larger grained materials, tend to adsorb more contaminants; suspend more readily thus influencing turbidity levels; form fluid mud layers; and spread further upon discharge. Also, deposits of sediments which are physically different from those at the receiving site can result in a greatly altered benthic population, which may or may not be as productive as the former.[9,10]

13. Elutriate data on the navigation channel sediments are compared to Corps' guidelines and to the analytical data on the receiving water to estimate the water quality impacts of discharging dredged materials. The majority of the guidelines were promulgated in the EPA publication, Quality Criteria for Water,[11] and updated in the 28 November 1980 Federal Register,[12] and provide for the protection and propagation of fish and other aquatic life and for recreation in and on the water in accord with the 1983 goals of Public Law (P.L.) 92-500. The criteria were established in

large part for evaluating long-term discharges from industrial point sources, not for assessing intermittent releases from dredged material discharge operations and long-term releases from discharged sediments. However, they provide protective guidelines for use in assessing disposal activities. Parameters without specific criterion were assigned guideline values based on available literature and/or State standards.

14. If a parameter was present in greater amounts in the elutriate analyses than in the guidelines and receiving water, dredged material disposal may negatively impact water quality at the DS. To determine the magnitude of the impact, the dilution factor and environmental characteristics of the DS must be considered. During open water disposal such impacts are generally short-term and insignificant. However, upland disposal can result in a continual overflow which can significantly impact receiving water.

15. The bulk sediment chemical data on the sediments is compared to guidelines to determine if there are significantly high levels of potential contaminants. This data is more useful in assessing potential long-term impacts from open water disposal than are elutriate test results. Of particular concern are those parameters which are readily bioaccumulated, such as pesticides, mercury, and lead. The bulk sediment analyses can also be used to interpret elutriate data since certain parameters may be released at high or low levels during an elutriate test even, though they are not present in a sediment at such levels. The bulk sediment data is derived from a soft digestion. It represents the amounts of the parameters which are adsorbed to sediments. The test is not a direct measurement of the amounts which are readily available for chemical reaction and biological uptake; it is just an indicator of potential.

16. Recent research has shown that many aquatic organisms live in delicate balance with potential toxicants.[18,19] Slight increases of contaminants can cause the death of such organisms or affect their detoxification mechanisms in such a manner that they bioaccumulate contaminants to a much greater extent than previously.[20] Since contaminants of anthropogenic origin tend to be loosely adsorbed to the surface layer of sediments rather than minerologically bound, they are much more available for biological

uptake than the minerologically bound ones. Through elutriate tests and bulk sediment analyses, relative amounts of contaminants of concern in the sediments can be estimated. Comparison of this data to the Corps' guidelines and background levels indicates if excessive contaminant levels are present. If high levels are present, potential impacts of disposal at designated sites are estimated. Further bioassays, biological, and/or bioaccumulation studies may be necessary when such impacts may be excessive given the types of contaminants present, the disposal site characteristics, and the dredged material quantities.

RESULTS

17. Physical Characteristics. As the field notes (table 1) indicate, the sediments appeared oily and had a strong hydrogen sulfide odor. This indicates a stagnating condition in the sediments such as is often observed in moorage areas with poor circulation characteristics. In such systems, the many small releases of oil, grease, anti-fouling treatments, detergents, and miscellaneous contaminants tend to settle in the bottom sediments. Also, fine-grained and organic materials from the river and tides may settle in such areas.

18. The physical characteristics of sediments collected both in 1981 and 1982 indicated stagnant conditions (table 2 and figures 3 through 5). The volatile solids and void ratios generally increased from the mouth of the moorage area into the small boat access channel. The grain size distribution of sediments collected in 1982 indicated that materials within the turning basin consisted of sandy-clayey-silt, and those in the small boat access channel of clayey silt. Volatile solids levels were moderately high (5.2 to 7.0 percent) in all samples. The roundness grade of the material indicated that it was probably close to its origin (angular to very angular).

19. The proposed ocean disposal site contains silt, sand, and rock (figure 3). Given this, the sediments from the river channel and the turning basin are approximately the same grain size as certain areas of the disposal site.

The void ratio, density, angularity, and organic content of the ocean sediments are unknown.

20. Chemical Characteristics. All three sediment samples underwent elutriate analyses for up to 42 parameters (table 3) as did the receiving water sample from Site 1. In addition, two of the samples (Sites 1 and 3) underwent bulk sediment analysis for 26 parameters (table 5).

21. The receiving water sample contained undetectible to low levels of the contaminants of concern when compared to Corps' guidelines. The sediments from the turning basin (Site 1) released more contaminants during the elutriate test than did the other samples (Sites 2 and 3), despite the fact that the other sediments appeared to be more contaminated. Such results may have resulted from higher organic and silt content of the Sites 2 and 3 sediments. Small grain size and organic materials tend to adsorb contaminants more readily and may reduce elutriation of contaminants of concern when pH levels stay as high as they did during the subject tests.

22. Generally, the elutriate analyses indicated little potential for water quality impacts from open water disposal operations. The only parameter present above guidelines was manganese and it would have been rapidly diluted to background levels. The bulk sediment analysis (Site 3 sediments) indicated that moderate levels of arsenic, cadmium, chromium, copper, and iron were present. These parameters are discussed below.

> Arsenic was present at levels only slightly above crustal abundance (5 ug/g).[13] The highly toxic, trivalent inorganic arsenic is converted to the less toxic, pentavalent form within 30 days.[11,14] Arsenic is accumulated, though not progressively; however, it can be directly toxic.[11]

> Cadmium was present at a level exceeding the old ocean dumping EPA criteria(.6 ug/g).[2] Cadmium is toxic, persistent, and bioaccumulative. Mutagenic and

carcinogenic properties are associated with it.[15] On the other hand, increased hardness or salinity tend to decrease cadmium toxicity.[11] At the cadmium levels found, no significant impacts should occur upon disposal of the proposed dredged sediments in an ocean site.[11,15]

Iron and Copper were present at levels above what is generally observed in sediments which are unaffected by man; however, they are rapidly precipitated in oxygenated, saline environments[11] and are not expected to cause significant impacts in such a system[16] unless at levels much higher than those found.

Sediments in the small boat access channel (Sites 2 and 3) contained excessive levels of volatile solids which could cause an elevated oxygen demand and reduced pH during upland disposal. Under low oxygen and pH, contaminants are generally more readily released.

CONCLUSIONS

23. Proposed dredged sediments from the mouth of the moorage basin oceanward are composed substantially of sand and are not expected to contain excessive levels of anthropogenic contaminants. This material meets the Sections 103 and 404 exemption criteria and is suitable for disposal at upland, estuarine, ocean beach, and marine discharge sites provided no significant human use characteristics, or environmentally significant resources are present at the specified sites. An assessment of such uses and resources is necessary before use of all DS.

24. Material within the turning basin (Site 1) and the small boat access channel (Sites 2 and 3) is of intermediate sediment quality. The presence of moderate levels of arsenic, cadmium, copper, and iron in the bulk sediment analyses indicate slight anthropogenic contamination of the sediments. Disposal of the proposed dredged sediments at the ocean DS would be unlikely

to cause significant biological/chemical impacts. Physical impacts would be minimized by placing like on like (see figure 2 for sedimentology of ocean disposal site).

25. The contaminant levels found are only slightly above background. Disposal at the high energy regimes of the ocean disposal site should result in redisposal and render the sediments harmless. The turning basin has not been dredged since its construction in 1969 and is not expected to require maintenance dredging for at least ten years. Given these factors and the relatively low amount of material requiring removal (20,000 cubic yards), the short and long-term impacts of the proposed project on the ocean disposal site are expected to be negligible.

26. The proposed upland disposal facility (DF) would be adjacent to the boat moorage. If hydraulic dredging were performed, excess water would be discharged back into the moorage area (figure 1). The elutriate data indicate that the discharged water quality would be good. On the other hand, the sediments have a high oxygen (DO) demand.[17] As the oxygen in the water is consumed, the pH may drop. The combination of low DO and pH may, in turn, result in a release of precipitated heavy metals, nutrients, and ammonia. Discharge of water containing high levels of contaminants and low DO and pH would not be in adherence with State and EPA water quality criteria and regulations. Some methods of reducing and monitoring the release of such poor quality water from an upland DS are discussed below:

a. Install an oil boom within the DS around the weir to prevent discharge of floating iron or organic flocs and oil. The boom should be regularly monitored to assure that its closure is complete. Materials collected by it should be regularly removed with straw or commercially available paper which absorb the contaminants and are then raked away. Such materials tend to be very highly contaminated and should be disposed into suitable containment facilities.

b. A splash spoon should be placed at the end of the pipeline to aerate the sediments. Further aeration can be supplied by placing a baffle system in the DS and/or in the weir; installing an aerator in the DS; or allowing discharged water to flow over a rough bottomed or baffled discharge ditch. Increasing the DO in these manners will result in precipitation of iron flocs which scavenge other heavy metals and nutrients from the water as well. This results in substantially better water quality. Also, a DO over 6 mg/l is necessary for survival of fish.

c. To assure that the discharge is adequately aerated, it should be monitored twice a week. If the DO level drops below 5 mg/l, excess water in the DF should be discharged only on an ebb tide. Discharging in such a manner would minimize impacts within the moorage, which is particularly susceptible to accumulation of toxic compounds.

d. The DF should be designed to allow for an adequate retention time to allow settling of fine grained and organic material. The DF discharge should contain less than 50 JTU of turbidity. Such turbidity is generally composed predominantly of fine grained sediments and organic material, both of which can contain significant amounts of contaminants. By assuring that turbidity remains relatively low, the contaminant release should also be maintained at low levels.

e. Exceptional problems may occur in regards to ammonia. This parameter is readily solubilized from dredged sediments and is highly toxic to aquatic life. Toxicity is dependent on pH and temperature. To determine if significant release of ammonia is occurring, it should be monitored twice a week. If it is released at levels exceeding .02 mg/l unionized ammonia,[3] discharge should only occur on ebb tides. Ammonia has historically been the contaminant most readily released during dredging and disposal operations. Though not of concern in terms of long-term or bioaccumulative effects, it can be highly toxic when released in excessive levels in areas which have poor circulation.

f. The contaminants in the sediments should be prevented from reentering the water through leachate or runoff subsequent to completion of dredging and disposal. The DF should be lined and capped with impermeable clay or commercially available liner.

g. The disposal site should also be zoned commercial or industrial to avoid uptake of cadmium by consumable vegetation such as would be grown on agricultural or residential areas.

27. Upland disposal of sediments which are dredged by a clamshell or other mechanical dredging apparatus should not result in a significant discharge of excess water. Thus, many of the management procedures discussed above would not be necessary. However, the DS should still be lined and capped with impermeable material and zoned so that consumable vegetation will not be grown on the site.

28. Dredging impacts from mechanical dredging will probably be greater than hydraulic dredging with upland disposal. If current regimes within the moorage are less than 5 knots, a silt curtain can be used to minimize spread of the turbid and contaminant-laden water produced by the dredging operation. Barring this, such dredging operations could cause major water quality impacts within the moorage area. Such impacts are not regulated by Sections 404 or 103 of the dredged material disposal regulations.[2,3]

29. If any significant water quality impacts occur from either dredging or upland disposal operations, the impacts can be minimized by operating only on ebb tide so that the affected water is carried from the moorage area into the river where it can be diluted. If ocean disposal is performed, dredged materials should be placed on sediments which resemble them as much as possible (like-on-like).

30. Only surface samples were tested for contaminants. Generally these tend to be more contaminated than deeper sediments. In the case of the channel deepening project, such is particularly expected to be the case since the sediments below 14 feet consist of naturally placed sediments. Thus, the total quality of the proposed dredged material is expected to be better than that which was tested.

BIBLIOGRAPHY

1. U.S. Army Engineer District, "Chetco River, Oregon, Navigation Project, Jetty Extension and Channel Deepening Project Description", Portland District, OR, 1982.

2. U.S. Environmental Protection Agency, "Ocean Dumping," Federal Register, Vo. 42, No. 7 (Tuesday, January 11, 1977).

3. U.S. Environmental Protection Agency, "Guidelines for Specification of Disposal Sites for Dredged or Fill Material," Federal Register, Vol. 40, Part 230 (Wednesday, December 24, 1980).

4. Ibid., "Testing Requirements for the Specification of Disposal Sites for Dredged or Fill Material," Federal Register, Vol 45, No. 249 (Wednesday, December 24, 1980).

5. U.S. Army Engineer District, "Supplemental Interim Procedures for Evaluating and Testing Discharges of Dredged Materials," Portland District, OR, February 1980.

6. Ibid., "Results of a Sidescan Sonar Survey, Chetco River, Oregon," March 1980.

7. Skougstad, Marvin W. et al., Methods for Determination of Inorganic Substances in Water and Fluvial Sediments, U.S. Geological Survey, U.S. Government Printing Office, Washington, D.C., 1979.

8. American Public Health Association, American Water Works Association, and Water Pollution Control Federation, Standard Methods for the Examination of Water and Wastewater, 14th Edition, American Public Health Association, Washington, D.C., 1976.

9. McCave, I.N., ed., The Benthic Boundary Layer, Plenum Press, New York, 1976.

10. Sollitt, C.U., "Measurement and Modeling of Various Estuarine Geotechnical Properties," Environmental Impacts of Dredging in Estuarines, Sect. IV A, OSU, Corvallis, OR, 1977.

11. U.S. Environmental Protection Agency, "Quality Criteria for Water," Washington, D.C., 1976.

12. Ibid., "Quality Criteria Documents; Availability," Federal Register, Vol. 45, No. 23, (Friday, November 28, 1980).

13. Ibid., "Arsenic," Report by Subcommittee on Arsenic, Committee on Medical and Biological Effects of Environmental Pollutants, NRC/NAS, Rpt. No. EPA 600/1-76-036, Washington, D.C., 1976.

14. Lueschow, L.A., "The Effects of Arsenic Trioxide in Aquatic Weed Control Operations on Selected Aspects of the Bio-environment," M.S. Thesis, University of Wisconsin, Madison, 1964.

15. Sittig, Marshall, (Ed), "Priority Toxic Pollutants", Noyes Data Corps., Park Ridge, NJ, 1980.

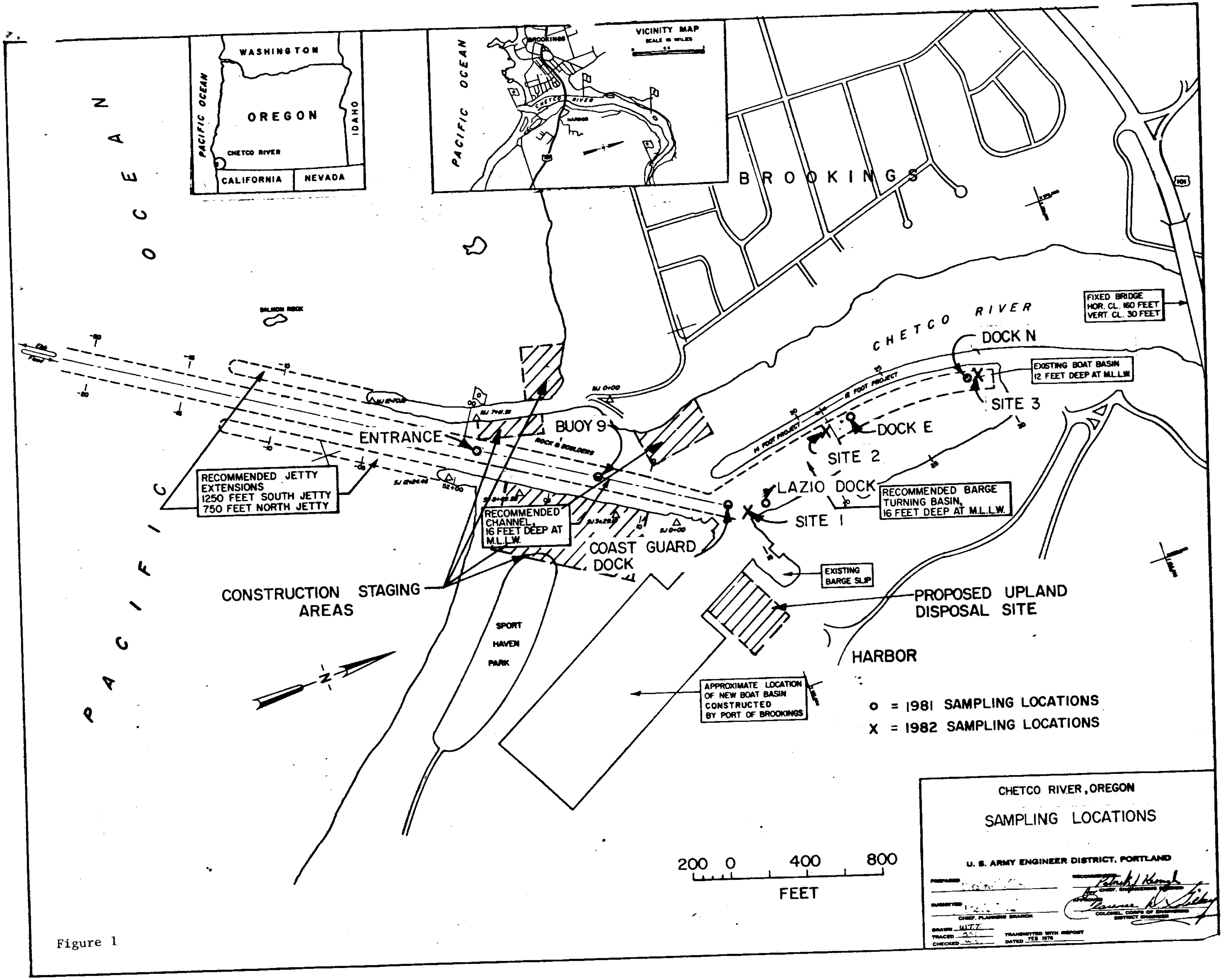
16. Bascom, "The Non-toxicity of Metals to Animals in the Sea", Shore & Beach, Vol. 5, No. 2, April 1982.

17. U.S. Geological Survey, "Native Water, Bottom Material, and Elutriate Analyses of Selected Estuaries and Rivers in Western Oregon and Washington," U.S.G.S. Open File Report 81-__________(in review).

18. Sunda, W.G., and R.R.L. Guillard, "The relationship between cupric ion activity and the toxicity of copper to phytoplankton", Journal Mar. Res., Vol. 34, 1976.

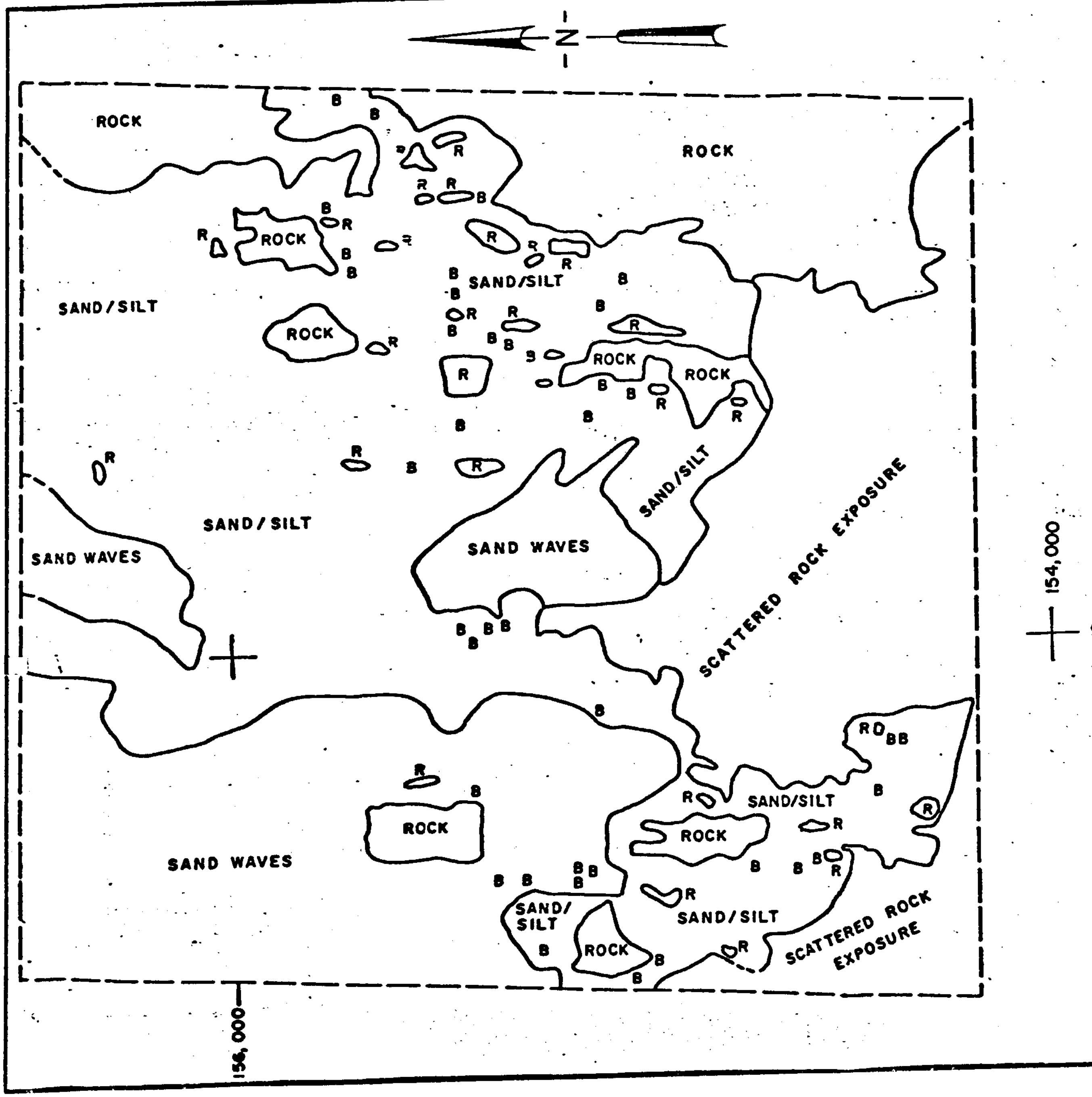
19. Engel, D.W., and W.G. Sunda, "Toxicity of cupric ion to eggs of the spot *Leiostomus xanthurus* and the Atlantic silverside *Menidia menidia*". Mar. Biol., Vol. 50, 1979.

20. Luoma, S.N., "Transport of Trace Elements from Particulates to Biota," U.S. Geological Survey, Water Resources Division, Menlo Park, CA (1982-Publication is in review).



WASHINGTON
OREGON
IDAHO
PACIFIC OCEAN
CHETCO RIVER
CALIFORNIA
NEVADA
VICINITY MAP
PACIFIC OCEAN
BROOKINGS
CHETCO RIVER
HARBOR
PACIFIC OCEAN
B R O O K I N G S
SALMON ROCK
CHETCO RIVER
FIXED BRIDGE
HOR. CL. 160 FEET
VERT. CL. 30 FEET
DOCK N
EXISTING BOAT BASIN
12 FEET DEEP AT M.L.L.W.
SITE 3
12 FOOT PROJECT
14 FOOT PROJECT
DOCK E
SITE 2
BUOY 9
ENTRANCE
ROCK & BOULDERS
LAZIO DOCK
RECOMMENDED BARGE
TURNING BASIN,
16 FEET DEEP AT M.L.L.W.
SITE 1
RECOMMENDED JETTY
EXTENSIONS
1250 FEET SOUTH JETTY
750 FEET NORTH JETTY
RECOMMENDED
CHANNEL,
16 FEET DEEP AT
M.L.L.W.
COAST GUARD
DOCK
EXISTING
BARGE SLIP
CONSTRUCTION STAGING
AREAS
PROPOSED UPLAND
DISPOSAL SITE
SPORT
HAVEN
PARK
HARBOR
APPROXIMATE LOCATION
OF NEW BOAT BASIN
CONSTRUCTED
BY PORT OF BROOKINGS
o = 1981 SAMPLING LOCATIONS
X = 1982 SAMPLING LOCATIONS
200 0 400 800
FEET
CHETCO RIVER, OREGON
SAMPLING LOCATIONS
U. S. ARMY ENGINEER DISTRICT, PORTLAND

Figure 1



NOTE

DRAWING BASED ON C OF E DRAWING TITLED CHETCO DISPOSAL DATED 23 MARCH 1982.

LEGEND

[- - -]	DENOTES AREAL COVERAGE
B	BOULDERS
R	ROCK

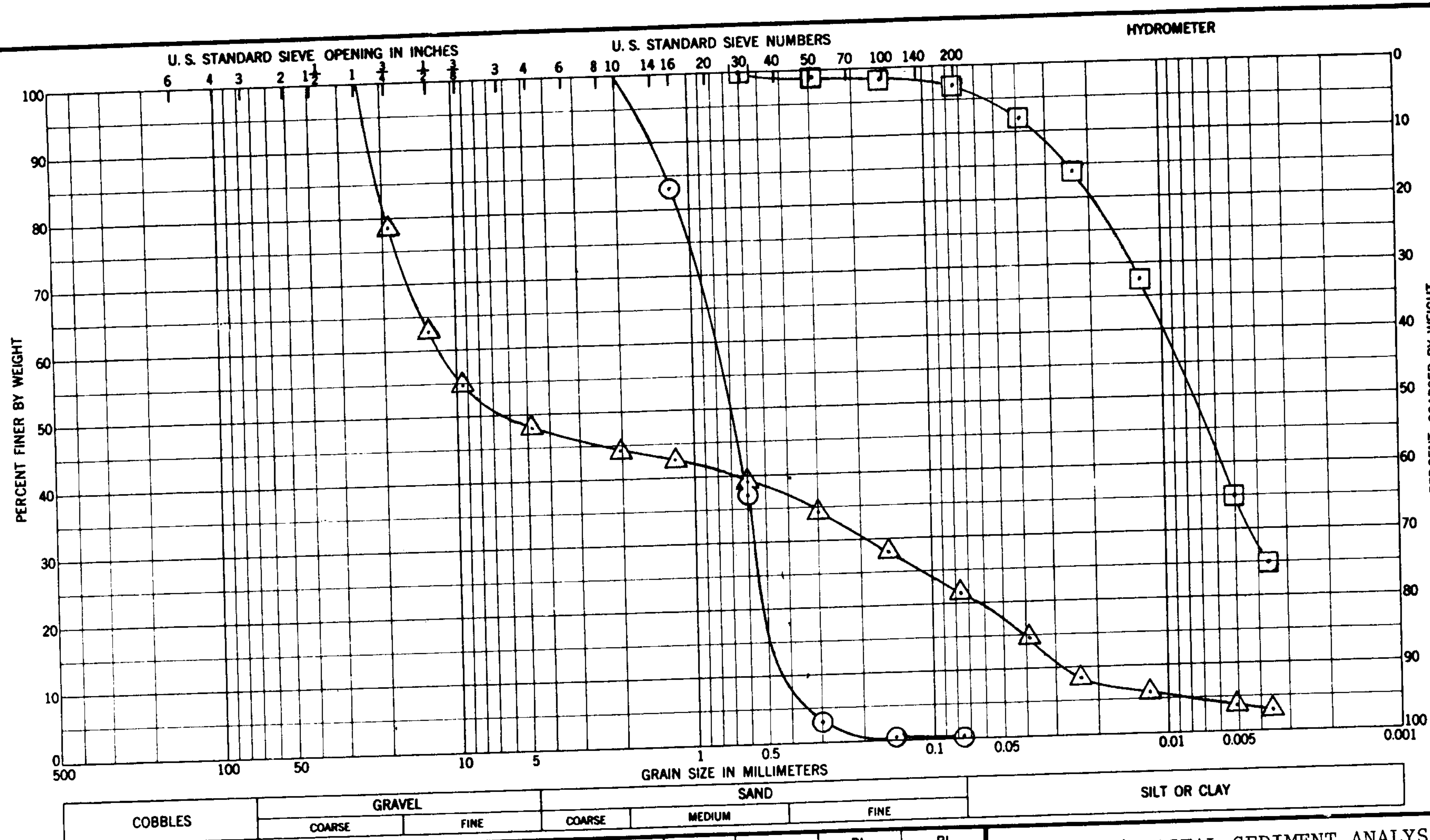
250 0 250
SCALE IN FEET

GEO RECON INTERNATIONAL SEATTLE, WASHINGTON	U.S. ARMY ENGINEER DISTRICT, PORTLAND PORTLAND, OREGON

CHETCO RIVER, OREGON
SIDE SCAN SONAR SURVEY
DREDGE SPOIL DISPOSAL SITE
SIDE SCAN SONAR COVERAGE

APRIL 12, 1982 J82-210

FIG. 2

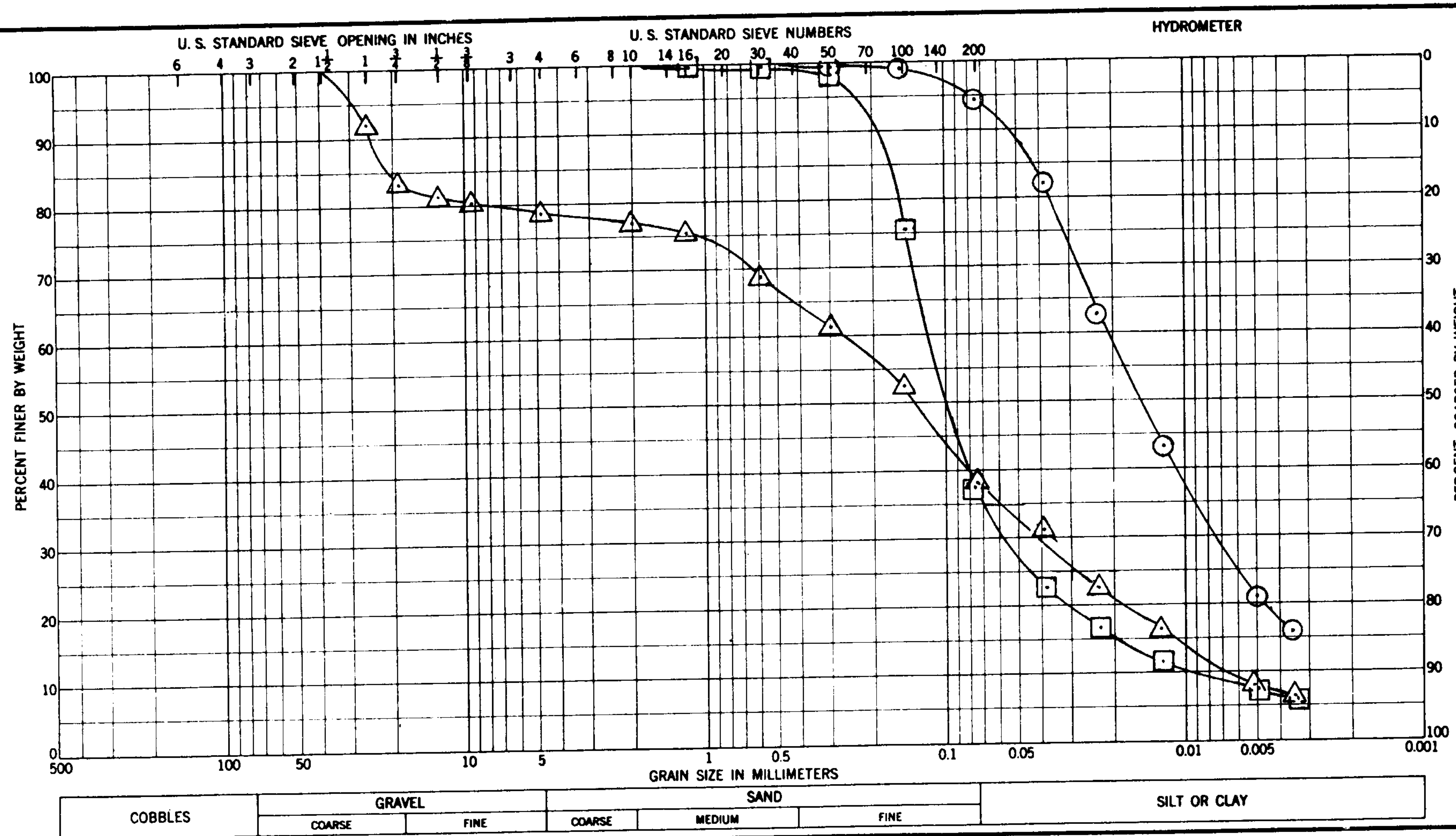


Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI	
⊙ Entrance		SAND (SP)					Project RIVER/COASTAL SEDIMENT ANALYSIS
△ Buoy 9		Si. Sa. GRAVEL (GM)					Area Chetco River
⊡ Boat Basin	- Dock E	SILT (ML)					Boring No.
					NPD		Date 17 February 1981 (81-S-816)

GRADATION CURVES

ENG FORM 1 MAY 63 2087

Figure 3



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
Boat Basin	- Dock N	SILT (ML)				
Boat Basin	- Lazio Dock	GR. Si. SAND (SM)				
Boat Basin	- Coast Guard	Dock Si. SAND (SM)				

NPD

GRADATION CURVES

Project RIVER/COASTAL SEDIMENT ANALYSIS

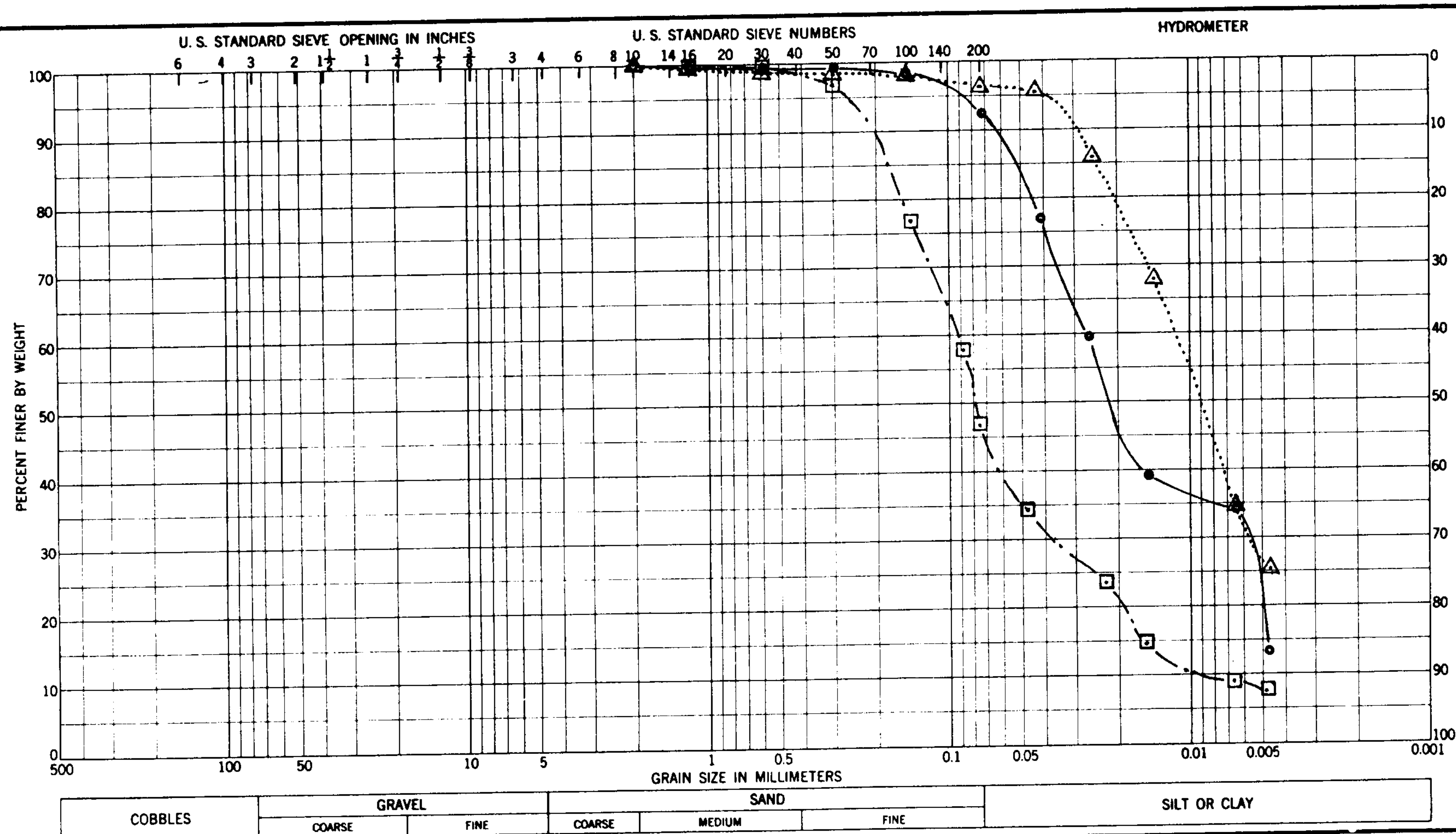
Area Chetco River

Boring No.

Date 17 Feb 81 (81-S-816)

ENG FORM 1 MAY 63 2087

Figure 4



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
Site 1		Silty Fine Sand (SM)				
Site 2		Fine Sandy Clayey Silt				
Site 3		Clayey Silt				

Project ROGUE AND CHETCO RIVERS

SEDIMENTATION ANALYSIS

Area Chetco River

~~Boring No.~~ ~~XXXXX~~ Sampled 6 Apr 82

Date (82-H-100)

GRADATION CURVES

ENG FORM 1 MAY 63 2087

Figure 5

FIELD REPORT - TABLE 1

CHETCO RIVER, OREGON

Purpose of Sampling 404/103 Sediment Sampling

Date 6 April 1982 Wind

Water Conditions (Wave heights & Direction, Tides, Currents) 5-foot waves/12-foot intervals

Weather Miserable Sampling Vessel Port authority's rowboat

Sampling Personnel Pam Moore, Duane Evans Sampling Gear Ponar & Van Dorn

Analytical Laboratory U.S. Geological Survey

Comments (Wildlife, Sampling Difficulties, etc.) three samples for three elutriates and one bulk sediment analysis.

Station	Depth	Sampling Time	Sampling Methodology	Sampling Description
3		1100	Ponar	Near boat launch but at N end of boat slips.
			One drop composite	Shiny, black, smelly. Thin, grey-brown surface
				≃ 1 cm thick. An oil film formed on water.
1		1130	Ponar	Next to commercial dock in turning basin.
			One drop composite	Grey sand with black fines, some smell.
2		1200	Ponar	Mid boat slip channel at west end (head) of
				boat slips. Intermediate sediment quality
				between sites 1 and 2, but smelled very bad.

Conclusions (Is sampling completed? Was sampling method adequate? Considerations for future sampling at the project)

Water was mostly fresh and collected at 1300 on outgoing tide. River current and height were up.

TABLE 2
SEDIMENT ANALYSIS

Chetco River

Sample Identification	Specific Gravity of Water	Density of Matl. in place gms/liter	Density of Median Solids gms/liter	Void Ratio	% Volatile Solids	Roundness Grade
Entrance 2-17-81	1.0121	2058	2728	0.641	1.29	Subangular to Subround
Bouy 9 2-17-81	1.0213	1864	2642	0.924	7.19	Angular to Subangular
Boat Basin - Dock E 2-17-81	1.0144	1519	2708	2.359	5.93	Angular to Subangular
Boat Basin - Dock N 2-17-81	1.0085	1520	2708	1.322	5.00	Angular to Subangular
Boat Basin - Lasio Dock 2-17-81	1.0173	1859	2711	1.012	4.35	Angular to Subangular
Boat Basin - Coast Guard Dock 2-17-81	1.0175	1827	2739	1.126	3.54	Angular to Subangular
Site 1 4-6-82	1.00	1591	2716	1.906	5.2	Angular to Very Angular
Site 2 4-6-82	1.00	1255	2664	5.535	7.0	Angular to Subangular
Site 3 4-6-82	1.00	1320	2645	4.146	6.1	Angular to Very Angular

TABLE 3
CHETCO RIVER ELUTRIATE ANALYSES
APRIL 1982

PARAMETERS	SITE 1	SITE 2	SITE 3	RECEIVING WATER	FRESH/SALT WATER QUALITY GUIDELINES
	Stations				
Arsenic, ug/l	9	4	4	<1	440/508
Barium, ug/l	400	<100	<100	11	
Beryllium, ug/l	<10	<10	<10	<3	130/
Cadmium, ug/l	1	1	<1	<3	1.5/59
Calcium, mg/l			48	6.2	
Carbon, Organic, mg/l	8.5	8.1	11	.7	
Chromium, ug/l	3	<1	<1	4	21/1260
Copper, ug/l	<1	<1	<1	2	12/
Cyanide, ug/l			<1		52/30
Hardness, mg/l			8.60	53	
Iron, ug/l	80	150	190	44	1000/
Lead, ug/l	<1	<1	1.0	<1	74/668
Magnesium, mg/l			180	9.2	
Manganese, ug/l	5300	130	70	28	/1000
Mercury, ug/l	.1	<.1	.2	<.1	.0017/3.7
Nickel, ug/l	18	4	6	4	100
Nitrogen, Nitrite mg/l	<.02				
Nitrogen, Nitrate	.14				
Nitrogen, Ammonia mg/l	3.6	3.3	3.5	.08	
Nitrogen, Organic mg/l			2.7	.31	
Phenols, ug/l					
Orthophosphate, ug/l	.02				
Zinc, ug/l	20	10	10	<12	180/170
Specific Conductance, umhos	7250	7979	10254	505	
pH	7.6	7.9	8.2	7.3	
Aldrin, ug/l	<.01	<.01	<.01	<.01	3.0/1.3
Chlordane, ug/l	<.1	<.1	<.1	<.1	2.4/.09
DDD, ug/l	<.01	<.01	<.01	<.01	
DDE, ug/l	<.01	<.01	<.01	<.01	1,050/14
DDT, ug/l	<.01	<.01	<.01	<.01	1.1/.13
Dieldrin, ug/l	<.01	<.01	<.01	< .01	2.5/.71
Endosulfan, ug/l	<.01	<.01	<.01	< .01	.22/.034
Endrin, ug/l	<.01	<.01	<.01	<.01	.18/.037
Hept Epox, ug/l	<.01	<.01	<.01	<.01	
Heptachlor, ug/l	<.01	<.01	<.01	<.01	.50/.053
Lindane, ug/l	<.01	<.01	<.01	<.01	2.0/.004
Naphthalenes, ug/l	<.10	<.10	<.10	<.10	
Mirex, ug/l	<.01	<0.01	<.01	<.01	.001/.001
PCB, ug/l	<.1	<.1	<.1	<.1	2.0/10
PCN, ug/l	<.1	<.1	<.1	<.1	
Perthane, ug/l	<.10	<.10	<.10	<.10	
Silvex, ug/l	<.01	<.01		<.01	
Toxaphene, ug/l	<1	<1	<1	<1	1.6/.07
2, 4-D, ug/l	<.01	<.01		<.01	
2, 4-DP, ug/l	<.01	<.01		<.01	
2, 4, 5-T, ug/l	<.01	<.01		<.01	
Strontium, ug/l			900	84	

TABLE

WATER QUALITY DATA

CHETCO RIVER, OR

DATE: 6 April 1982

SAMPLING PERSONNEL: Pamela A. Moore, Duane Evans

WEATHER CONDITIONS: Miserable, overcast, amb. temp. 54°

COMMENTS: (Wildlife, vessel traffic, completion status of training jetty, sampling gear difficulties, sampling vessel, etc.) 5-foot waves, 12-foot intervals, barometric pressure - 29.8 millibars. Gale force winds, used Port vessel. Sampled from Coast Guard dock.

Parameter	Station	
	Surface	Bottom
Depth		10-12 feet
Dissolved Oxygen	12.2	12.4
Conductivity	.005	.005
Salinity		
ORP	246	253
Temperature	6.5	6.5
pH	7.6	7.5
Turbidity		
Time	1240	

* Data obtained with a Hydrolab 8000 water quality testing system.

TABLE 5
CHETCO RIVER BULK SEDIMENT ANALYSIS
APRIL 1982

PARAMETERS	SITE 3	CORPS GUIDELINES
Aldrin, ug/kg	<0.1	10,000
Arsenic, ug/g	9	3-8
Cadmium, ug/g	3	6
Chlordane, ug/kg	<1	10,000
Chromium, ug/g	10	25-75
Copper, ug/g	37	25-50
DDD, ug/kg	<0.1	10,000
DDE, ug/kg	0.1	10,000
DDT, ug/kg	<0.1	10,000
Dieldrin, ug/kg	<0.1	10,000
Endosulfan, ug/kg	<0.1	10,000
Endrin, ug/kg	<0.1	10,000
PCB, ug/kg	1	10,000
PCN, ug/kg	<1	10,000
Hept Epox, ug/kg	<0.1	10,000
Heptachlor, ug/kg	<0.1	10,000
Iron, ug/g	9,000	17,000-25,000
Lead, ug/g	<10	40-60
Lindane, ug/kg	<0.1	
Manganese, ug/g	300	300-500
Mercury, ug/g	0.14	1
Mirex, ug/kg	<0.1	10,000
Methoxychlor, ug/kg	<0.1	10,000
Perthane, ug/kg	<1	10,000
Toxaphene, ug/kg	<10	10,000
Zinc, ug/g	41	90-200

NOTE: Data on sediment sample from Site 1 was not available at the time this report was written. This table will be updated when the data is obtained.